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ABSTRACT

The relationship between high school graduation and a number of variables, including personal characteristics, economic factors, stress factors, and the timing of events, is examined. A longitudinal sample of approximately 1,300 individuals provides evidence that completion of high school is positively associated with being nonwhite and female, growing up in a family having a religious affiliation, and growing up with only a few siblings. Most significant for high school graduation is the educational level of the parents. Experiencing family dislocations (such as moving and the divorce of parents) and having less parental time in the preschool years are negatively associated with completion of high school. Having a mother who works generally has a positive association with high school completion that increases as a child gets older. On the other hand, stress caused by family breakup or a physical move has its greatest impact on children in the youngest and oldest age groups measured (those between 4 and 7 and between 12 and 15). Problems of unobserved variables and potential endogeneity continue to raise questions about the results of research of this nature. Appendix A contains coefficients and standard errors from time-use data regressions, and Appendix B presents coefficients and standard errors for study variables, (Contains 3 tables and 21 references.) (Author/SLD)

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THE RELATION OF EDUCATIONAL ATTAINMENT TO CHILDHOOD EVENTS AND CIRCUMSTANCES

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The Relation of Educational Attainment to Childhood Events and Circumstances

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Abstract

The relationship between high school graduation and a number of variables, including personal characteristics, economic factors, stress factors, and the timing of events, is examined. A longitudinal sample of approximately 1300 individuals provides evidence that completion of high school is positively associated with being nonwhite and female, growing up in a family having a religious affiliation, and growing up with only a few siblings. Most significant for high school graduation is the educational level of the parents.

Experiencing family dislocations (such as moving and the divorce of parents) and having less parental time in the preschool years are negatively associated with completion of high school.

Having a mother who works generally has a positive association with high school completion that increases as a child gets older. On the other hand stress caused by family breakup or a physical move has its greatest impact on children in the youngest and oldest age groups measured (those between 4 and 7 and between 12 and 15).

Problems of unobserved variables and potential endogeneity continue to raise questions about the results of research of this nature.

The Relation of Educational Attainment to Childhood Events and Circumstances

The determinants of educational attainment have been extensively studied by both economists and sociologists. Economists have viewed educational outcome as determined by the interaction of supply-side considerations (e.g., access, quality, and cost) and the utility accruing to both parents and their children from both monetary (income) and nonmonetary returns to education. Parents are viewed as choosing the quantity and quality of education of their children, constrained by the resources at their disposal, the effective costs of obtaining additional education, and the gains available from allocating their resources (including time) to other uses. Even though there is no formal market for most educational services, economists have envisioned the existence of an effective price attached to these services, which price--in equilibrium--reflects both the marginal cost and value of schooling. Sociologists, on the other hand, have concentrated on those determinants of educational outcomes associated with the characteristics of the families in which children are reared, the neighborhood and other environmental circumstances existing during childhood, and the effectiveness of schools and the educational process.

The research reported here begins with an economic view of the determinants of schooling but enriches this view with the insights from the sociology literature. Utilizing a rich longitudinal data base of about 1300 children, we estimate a reduced form model in which educational attainment (measured as graduation from high school) is related to a variety of economic and family background characteristics. Our concern is the measured effect of a variety of economic and family

characteristics during childhood years (e.g., family economic status, parental separations, remarriages or other changes in family head, residence moves, years on welfare, and the amount of child care time received during childhood) on educational attainment. In particular, we focus on the timing of these circumstances and events, and the impact of these dated occurrences on educational outcome. We conclude that a variety of these circumstances and events are closely related to educational outcome, and that, in particular, the timing of the occurrence of a number of them is important.

In section I we briefly review the economic and sociological literature on the correlates of educational attainment, describing both the methods used and the estimated results. None of the extant studies employ longitudinal data of the length and richness of those used in this research. In section II we present a very simple economic model of the demand for schooling, indicating the variables that proxy for economic determinants of this choice. Our simple model is then extended to include a variety of variables emphasized in the sociological literature. The data that we have constructed and use in this study are described in section III, while section IV presents the basic results of our exploration, moving from the simplest models to those of increasing complexity. There we document the reduced form relationship of the economic and family characteristics during childhood years on educational attainment. In section V the timing of these circumstances and events is related to the outcome of interest, and a description of the time-related occurrence of the circumstances and events on educational achievement is described. Section VI contains a summary and suggested next steps.

I. LITERATURE REVIEW

The economics literature views household decisions regarding the schooling of children in the same framework as other choices regarding the allocation of scarce resources. Family well-being is maximized through such choices, with the individual well-being of both parents and children being incorporated into the family welfare function. Especially in the literature on human capital and the economics of fertility, the number of children is an important choice variable, and a trade-off between quantity and "quality" of children is recognized. Given the scarce time and financial resources available to the family, the time and money costs of securing additional children's schooling is a relevant consideration. Similarly, the gains from additional schooling--increased children's earnings, increased parental security, increased social status, and socially approved behaviors--are compared to the gains available from alternative uses of family time and resources. Out of this maximizing framework comes the family demand for the number of children and the schooling for its children--family well-being will be maximized given the expected benefits from schooling, the costs of securing it, and the family's budget constraint, mediated of course by children's tastes, behaviors, and aptitudes.

In the empirical literature, the family demand for children's schooling is emphasized. Family resource factors (e.g., family income and assets, available family time) are included in these models, as well as the effective cost of securing educational services (e.g., tuition, travel cost, and school quality), and expected labor market

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opportunities (e.g., some estimate of future relative wages). A variety of control variables are also included, to capture tastes for schooling relative to alternative consumption or investment opportunities (e.g., parental schooling) or relative advantages in the procurement of schooling (e.g., children's ability or IQ). The results of these estimates indicate that parental education and parental income and assets are strong determinants of the demand for children's schooling.

These results have several interpretations. Parental education may reflect tastes for education, permanent income, genetic factors (e.g., IQ), or labor market opportunities (e.g., "connections"). Becker (1981) provides a different interpretation: Since more highly educated parents have a lower demand for quantity of children, in part because of greater market opportunities requiring greater time commitments (Michael, 1973), these families have greater resources available for investment in the quality of their children. This investment is reflected in part by greater schooling levels for their children. Because data limitations restrict the relevant demand and supply considerations that can be included in these models, the included variables may also be proxies for a variety of unobserved family background variables, such as genetic factors, parental time spent with children, and the nature of parental role models.

Several studies in the last decade have attempted to control for these unobserved variables in estimating the determinants of schooling levels, making use of sibling data reflecting unobserved family- or neighborhood-specific factors. These studies find these unobserved characteristics, taken to reflect expected income and productivity, to be important determinants of children's schooling. However, the

allocation of this impact among its possible determinants (e.g., genetic factors, preschool and out-of-school investments in children, tastes for schooling or leisure, the opportunity costs of school time, or (in a world with imperfect capital markets) the ability to secure financing for education) has not been settled.

In the sociological literature, serious quantitative study of the determinants of achievement began in the 1960s. In this literature, understanding the process of social mobility and stratification was the primary concern. This process was viewed as determining "the extent to which persons are recruited or assigned to roles bearing unequal rewards on the basis of the circumstances of birth or rearing in a particular family, locality, cultural or ethnic group, or social milieu" (Duncan, Featherman, and Duncan, 1972, p. 2). The primary outcome of interest in this literature is the occupation of an individual, and in particular the socioeconomic status associated with that outcome. The basic model which guides much of the research on this question is known as the socioeconomic life cycle model--final achievement (job) is determined by schooling which is in turn determined by family background characteristics (family head's education, family head's occupation), which characteristics may themselves directly affect the final outcome (Duncan and Hodge, 1963; Blau and Duncan, 1967). In this research based on an explicit causal model, father's occupation and father's education are positively and significantly associated with the child's educational achievement, with the former variable appearing to be slightly stronger. The number of siblings of the respondent is negatively and significantly associated with educational achievement, as is growing up in a "broken" family (B. Duncan, 1967).

While this status attainment research has the strengths that come with large representative microdata sets to which strictly specified causal models are applied, it is incapable of shedding light on a wide variety of other expected determinants of achievement in young adulthood. Family economic status (e.g., family income or assets, home ownership), the changing of family location, and the participation in welfare programs come immediately to mind. Moreover, because of both data limitations and the restrictions of modeling, this research is not capable of distinguishing among a variety of aspects of family economic status or structure, or changes in economic status or structure, or the duration and timing of status and structure or changes in them.

More recent sociological research has attempted to extend the findings of the early status attainment literature by relying on longitudinal data. McLanahan (1985), for example, studied the effects of family status (in particular, the father being absent when the child is age 17) on educational attainment (being in school at age 17 and extent of completed education by age 23). Four hypotheses were studied--that low levels of educational attainment are caused by race, education, and occupation of parents, and not by the absence of one parent; that poverty rather than growing up in a single-parent family is the source of lower educational attainment; that it is indeed the absence of a father that contributes to lower attainment; and that it is the marital disruption of parents that causes poorer academic attainment. Eleven years of longitudinal data on nearly 3300 individuals who were between that ages of 17 and 27 in 1978 and who were dependent children at age 17 were used in the analysis. McLanahan concluded that having an absent father adversely affects educational

attainment, and that the relative economic deprivation associated with single-parent status is a likely cause of this lower educational attainment. Neither being on welfare nor having an employed mother showed a consistent relationship with the child's educational attainment, whereas recent marital disruption appeared to be an important determinant of lower educational achievement.

While the McLanahan study exploited longitudinal data to examine family resources and circumstances on the attainment of young adults, it was limited in the length of the period over which observation occurred. Two dependent variables were studied--in or out of school at age 17 and completed education at age 23. For the second variable, only youths 23-27 in 1978 were studied, less than one half of the cohorts in the sample. In both analyses, two family indicator variables were used--the marital status of the parents when the child was 17 years old (distinguishing among never-married, widowed, and divorced/separated mother-only families) and the length of time since the parents' marriage was disrupted. Hence, only the family circumstances when the child was 17 years old (and a rough indication of the duration of the father's absence) were analyzed, and little information regarding the events and circumstances of the child prior to that age was taken into account in the analysis. In addition, race, sex, city size, region, family income, and need in the year in which the child was 17 years old, whether or not the mother worked when the child was 17 years old, whether the child worked when he or she was 17 years old, and whether the family was on welfare when the child was 17 years old were introduced as independent variables. None of these variables, it should be noted, exploited the

longitudinal nature of the data or provided indication of the effects of family resources or circumstances on educational attainment.

II. A SIMPLE MODEL OF THE DETERMINANTS OF SCHOOLING

Following the basic framework of the economics literature on the determinants of demand for schooling, extended to include sociological considerations, we posit the following simple model:

$$S = \underline{\alpha}'\underline{X} + \underline{\beta}'\underline{Y} + \underline{\gamma}'\underline{Z} + u, \qquad (1)$$

where S = the level of schooling attained, X = a vector designed to capture the expected benefits of schooling, Y = the vector of expected resources required for a child's schooling or allocated to his/her additional schooling, and Z = a variety of family background and family resource variables, including those drawn from the sociological literature as being *a priori* related to children's schooling. u is the error term, and α, β, and γ are vectors of parameters to be estimated.

The vector of X variables includes the gender, religion, and race of the child (to reflect expected labor and marriage market opportunities and/or connections). The Y vector includes the birth position of the child, the region of the country in which the child lives, and the urban/rural location of the child (to reflect differential public education expenditures, among others). Family background and resource variables included in Z are the education of the parents, the number of siblings of the child (as proxies for the competition for the family's resources), family income, family home ownership, family access to public income transfers, and the amount of

child care time allocated to the child. From the sociological literature, we add the family stress variables associated with parental separation and remarriage and family household location changes. We estimate the model in two ways; one in which we use the average value of these variables over the individual's childhood (as in 1 above) and the second in which the variables are age-specific where appropriate or

$$S = \underline{\alpha}'\underline{X} + \underline{\beta}'\underline{Y} + \underline{\gamma}'\underline{Z}_1 + \underline{\varrho}_t'\underline{Z}_{2t}, \qquad (2)$$

where t refers to the child's age.

III. THE DATA AND THE VARIABLES

The basic sample of observations used for the analysis comes from the 1986 tape (wave 19) of the University of Michigan's Panel Study of Income Dynamics (PSID). The individuals selected from that tape are those who were aged 6 years or less in 1968, the first year of the panel survey, and who were still in the survey sample in 1986. In 1986, these individuals were from 18 to 24 years of age. There were 1850 individuals in this sample.[1]

The individuals in the sample, then, were children during most of the period of observation, but by the terminal year were all young adults. Information relevant to each individual is taken from each of the 19 years of the panel survey, and include personal characteristics (e.g., race, sex, age, education, marital status, and work and earnings after age 19), the characteristics of the family in which the person lived (e.g., number of parents and the characteristics of each, such as age, race, and education), characteristics of the grandparents of the

individuals in the sample, changes in family composition, such as marital separation or divorce, number of siblings and their characteristics, and information on the level and composition of income and assets for the family, labor force participation of the parents, welfare recipiency, and location by region and urban/rural site. Those variables that are not permanent characteristics of either the individual in the sample or the members of his/her family are time-indexed.

Of the 1850 observations that met our criteria for inclusion in the sample, 41 had two or more years of missing information. These observations were discarded. Those observations with but one year of missing data (23 observations) were retained, and the missing data were filled in largely by averaging the data for the two years contiguous to the missing information.

To enable observations from different birth years to be compared, all of the time indexes were transformed from the year of the survey to the age of the individual. Hence, for two individuals aged 1 and 4 in 1968, for example, we obtain comparable information on each from ages 4 to 15 by using the data on the 1971-82 waves for the first child, and the data on the 1968-79 waves for the second. For monetary data, all dollar values were converted to 1976 prices using the Consumer Price Index.

In order to estimate the amount of time that parents have spent in child care activities with their children, data from a second source--the University of Michigan Time Use Data Set--were merged with the basic PSID data. The time use data were constructed from time diaries filled out in 1972 and 1975-76, in which respondents entered the amount of time

spent in various activities in a "typical" day. We constructed a "time spent in child care" variable by adding the times spent in activities which we judged to be child care, and we then expanded this estimate to an annual basis. An imputed estimate of this child care variable was calculated for every family on the PSID from a regression of the child care time variable in the time use data set on family characteristics, income, and other variables, which were comparable over the PSID data and the time use data.[2] The estimate of child care time was made for every parent, even though some of the independent variables such as family income were the same for both parents. Separate regressions were run for both male and female parents, with one of the independent variables being the presence or absence of a spouse. The list of regressors and coefficients is shown in Appendix A.

Our estimates are based on a probit regression in which the dependent variable is a 0-1 variable indicating whether an individual had (= 1) or had not (= 0) completed high school in 1986. Individuals aged 18 and still in high school in 1986 were coded as having completed high school.

For these estimates, we used a subsample of 1296 individuals out of our full sample of 1850. We eliminated the two eldest cohorts (those who were age 5 or 6 in 1968) in order to include a richer set of information at early ages, specifically from age 4 onward, for each child. We ran the estimates over this entire subsample and also tested for differences between the random observations and the Survey of Economic Opportunity subsample observations, to account for the oversampling in the PSID from the low-income population.

The independent variables were of three types: 1) demographic and background information on the child and his/her parents; (2) measures of the economic circumstances of the family while the child was between ages 4 and 15; and (3) indicators of family stress during childhood. For the stress variables, we coded the variable for each year of the 12-year span, assigning a value of "1" if the event occurred in that year and a "0" otherwise. In addition, a variable reflecting the parental time allocated to the child in preschool years was included.

Basic Background Variables

- Race (nonwhite = 1)
- Gender (female = 1)
- Number of siblings
- Birth order (first born = 1)
- Religion[3] (dummy variables for Protestant, Catholic, and Jewish, with Other being the excluded category)
- Parents poor (parents were poor while they grew up = 1)
- Father's education[3] (dummy variables for high school graduate, some college, and college graduate, with less than high school being the excluded category)
- One parent in 1968 (only one parent present in 1968, hence no education variable is available for father)
- No parents in 1968 (no parents present in 1968, hence no education variable is available for mother or father)
- Mother's education[3] (defined in the same way as the father's education)
- Head foreign born (foreign born = 1)

Variables Measuring Events That Occur over Time

• Poverty status (= 1 if the family's income is below the matched poverty line for that year)

• Household move (= 1 if a change in household location is made by the family of the individual in that year)

• Parental separation (= 1 if the parents of the individual separated or divorced in that year)

• Parental remarriage (= 1 if the parent of the individual remarried in that year)

• Other changes in family structure (= 1 if the individual experienced a change in family head other than those occurring through parental separation or remarriage in that year)

• Total number of child care hours allocated to the individual in preschool years (ages 4 and 5)

• Years in SMSA (lived in urban area in that year = 1)

• Welfare recipiency if poor (= 1 if the individual lived in a family that was poor and received benefits from the Aid to Families with Dependent Children program in that year)

In the most basic set of estimates, we totaled the number of times each time-related event occurred in the child's family from age 4 to age 15. In subsequent estimates designed to gauge the differential effect of circumstances and events occurring at different times through childhood, the poverty, household moves, parental separation, parental remarriage, change of family head, and welfare recipiency variables were redefined in two ways. In the first estimate, each was entered as a dummy variable (= 1 if the circumstance or event occurred) for the age

categories of 4-7, 8-11, and 12-15. In the second, each was entered as the total number of times the circumstance or event occurred over each 4-year time period.

IV. THE BASIC ESTIMATES

Table 1 presents our estimates of the correlates of educational attainment for our sample of young adults. Column 1 shows the relationship of background variables to the probability of graduating from high school for our sample of 1296 young adults, excluding considerations of the economic status of the family or of family stress during childhood years. Column 2 is a richer specification, which adds variables measuring these economic status and stress factors to the equation.

The signs of the background variables are virtually identical in each of the estimates. Controlling for the large number of effects included in the model, being nonwhite is positively associated with educational attainment (but has only a 1.1 t-value) a result that has been found in a number of other studies (see, for example, Crane, 1988; Altonji, 1988; Corcoran, et al., 1987), but one which nevertheless runs against conventional wisdom.[4] (A test on whether the two groups have differing underlying determinants of high school graduation using these two equations indicates they do not.) Females, especially nonwhite females, tend to have higher rates of high school completion, although these results again are not statistically significant. Being Catholic is significantly associated with graduating from high school, relative to indicating no religion (Coleman, Hoffer and Kilgore, 1982). (There

Table 1

Probit Estimates of Background, Economic, and Family Stress Determinants of Educational Attainment
(High School Graduation = 1)
(Standard Errors in Parentheses)

	(1)	(2)
Constant	0.649 **	0.112
	(0.210)	(0.329)
Background Variables		
Nonwhite	0.151	0.103
	(0.143)	(0.150)
Female	0.132	0.123
	(0.138)	(0.142)
Nonwhite * female	0.0888	0.0792
	(0.181)	(0.186)
Catholic	0.520 **	0.415 **
	(0.194)	(0.200)
Jewish	3.06	2.73
	(36.19)	(35.76)
Protestant	0.164	0.119
	(0.161)	(0.164)
Number of siblings	-0.0918 **	-0.0771**
	(0.0303)	(0.0347)
First born	0.0822	0.153
	(0.120)	(0.128)
Father HS grad	0.332 **	0.349 **
	(0.130)	(0.136)
Father some college	0.748 **	0.679 **
	(0.225)	(0.232)
Father college grad	0.458 *	0.394
	(0.254)	(0.262)
Mother HS grad	0.368 **	0.411 **
	(0.105)	(0.114)
Mother some college	0.637 **	0.695 **
	(0.225)	(0.235)

Table 1, continued

Table 1, Continued

	(1)	(2)
Mother college grad	3.63 (24.05)	3.69 (23.91)
One parent in 1968	-0.197 * (0.120)	0.0691 (0.148)
No parents in 1968	0.0152 (0.214)	0.280 (0.237)
Father foreign born	-0.0643 (0.361)	-0.0287 (0.363)
Years in SMSA	-0.0217 ** (0.00962)	-0.0185 * (0.0105)
Parents poor	0.0668 (0.0959)	0.00520 (0.0994)
Economic Variables		
Number of years in poverty		-0.00829 (0.0193)
Number of years in poverty * AFDC		-0.0157 (0.0249)
No. of years mother worked		0.0435** (0.0121)
Family Stress Variables		
Number of location moves		-0.126 ** (0.0245)
Number of parent separations		-0.0444 (0.113)
Number of parent remarriages		0.0484 (0.130)
Number of other changes in family		-0.0453 (0.134)
Child Care Time		
Preschool time		2.32 E-4** (0.846 E-4)

*Significant at .10 level.
**Significant at .05 level.

are too few individuals of Jewish religion to allow for the interpretation of this variable.) This result is consistent with studies of high school dropout patterns (Freeman and Wise, 1982; Freeman and Holzer, 1986). Our estimates of the effect of having a large number of siblings (negative and significant) are consistent with findings in the demography literature[5] (Becker, 1981; Blake, 1981). The results in column 2 suggest that children with three siblings have a 4 percent lower probability of graduating than only children; children with six siblings, about a 9 percent lower probability of graduating.[6]

Finally, the educational backgrounds of the parents of the youths in our sample are positively and significantly related to the probability that their offspring will graduate from high school.[7] Several patterns are worth noting. First, in column 1 (the model without the economic and family stress variables), the influence of father's education is at least as strong as that of mother's education. However, in column 2 the effect of two of the three father's education variables falls somewhat while the effect of mother's education does not, suggesting that the column 1 results reflect the impact of economic circumstances and its correlates rather than only father's education. Second, while the effect of both father's and mother's education is monotonic and significant throughout the post-high school level--consistent with other literature (Engle, 1980; Wolfe and Behrman, 1984) --the effect of being a college graduate is smaller than attending some college for the father; large standard errors make interpretation of the mother's college graduation variable problematic. The other two measures of family background--parents growing up in poor families and head foreign born--are not statistically significant. The variable

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measuring location (SMSA) shows a significant negative association with high school completion. The dummy variables representing the presence of one or no parents in 1968 show no clear pattern. Overall, the background model (column 1) is very similar to the more comprehensive model. To the extent there are differences, the background-only model seems to slightly misrepresent and possibly somewhat overemphasize the role of father's education, religion, one parent in 1968, and residence in an SMSA.

The estimates for the economic variables reveal interesting patterns. Living in a poor family negatively affects the probability that a child will complete high school, but this result is not statistically significant. In terms of difference in the probability of graduation, these results imply that a person who spends 6 years in poverty is 1.4 percent less likely to graduate compared to someone who spends no time in poverty, and a person who spends 12 years in poverty is about 4 percent less likely to graduate. The variable representing the years that the mother worked is positively and significantly related to high school graduation. However, the variable for years on welfare if poor has no apparent relationship to the probability of graduating from high school.

In the next bank of variables, we have attempted to capture the effect of family disruptions--separation/divorce, remarriage, location change--on the probability that the youth will complete high school. All of the signs are what one would expect--those family changes indicating disintegration or dislocation tend to reduce the probability of graduating from high school; the change suggesting restabilization (the remarriage of a single mother or father) improves the chances of

graduating (see, for example, Krein and Beller, 1988). Only the location-move variable is statistically significant.

Finally, we include a variable measuring the effect of child care time on the level of educational attainment of the youth. This variable is an imputed value from another regression (see above), and measures the total number of hours of child care time of all parents devoted to the child during the preschool ages of 4 to 5. The coefficient has the expected positive sign and is significant. In addition to measuring child care time, it also proxies for the presence of two parents in the household.

Taken by themselves, these results are revealing. They suggest that economic factors, such as having a working mother, have an important effect on the educational attainment of children. Disintegration and disruption of family life, particularly changing location, also tend to reduce the probability that a child will complete high school. The extent of welfare dependency does not have a clear effect on educational attainment when poverty status is accounted for, perhaps reflecting both the positive income effects from welfare receipt and the adverse effects that are associated with the neighborhoods and life styles of welfare recipients.

V. THE TIME-RELATED ESTIMATES

The estimates presented in Table 1 indicate the effects of a variety of family economic, stress, and child care characteristics during childhood (ages 4-15) on youth educational attainment. They provide no insight regarding the timing of the effects of these

formative year factors on the educational performance variable. Speculation and some research (Krein, 1986; Marino and McCowan, 1976; and Krein and Beller, 1988) have suggested that the timing of the occurrence of certain events or circumstances is, indeed, relevant to the outcomes of interest. For example, the provision of parental child care time when a child is young is often alleged to have a stronger effect on the child's development than the provision of parental time later in the child's life. Similarly, the impact of family stress--especially, parental separation and divorce--is believed by many to be larger in the years immediately following the event than in subsequent years (McLanahan, 1985).

In Table 2, we present results directed at these issues of timing. The period over which we have observed the individuals in our sample as children (ages 4 to 15) is broken up into three age categories--ages 4-7, ages 8-11, and ages 12-15. Then, the economic, family stress, and child care variables are measured with respect to each of these periods in the child's life.

In column 1 of Table 2 each of the age-related economic and family stress variables is a 0-1 dummy indicating whether or not the event took place during the age category indicated. Column 2 retains the full set of event and circumstance variables, but uses the actual number of events during an age span as the measure of the independent variable. For example, "In poverty, ages 8-11," could range from 0 to 4, depending on how many years in that age range the income of the family fell below its matched poverty line.

Consider first the effects of the economic factors that we have identified. A spell of poverty does not appear to be related to the

Table 2

Probit Estimates of Background and Time-Related Economic and Family Stress Determinants of Educational Attainment
(High School Graduation = 1)
(Standard Errors in Parentheses)

	(1)	(2)
Constant	0.292 (0.335)	0.286 (0.337)
Background Variables		
Nonwhite	0.153 (0.152)	0.0734 (0.153)
Female	0.109 (0.143)	0.115 (0.145)
Nonwhite * female	0.100 (0.190)	0.115 (0.190)
Catholic	0.405 ** (0.203)	0.380 * (0.204)
Jewish	2.81 (36.20)	2.73 (35.95)
Protestant	0.119 (0.166)	0.114 (0.167)
Number of siblings	-0.0604 * (0.0360)	-0.0820 ** (0.0357)
First born	0.152 (0.130)	0.162 (0.131)
Father HS grad	0.316 ** (0.137)	0.313 ** (0.138)
Father some college	0.587 ** (0.235)	0.582 ** (0.234)
Father college grad	0.358 (0.265)	0.356 (0.268)
Mother HS grad	0.411 ** (0.116)	0.410 ** (0.116)
Mother some college	0.674 ** (0.240)	0.700 ** (0.240)

Table 2, continued

Table 2, Continued

	(1)	(2)
Mother college grad	3.66	3.70
	(23.91)	(23.92)
One parent in 1968	0.141	0.0577
	(0.153)	(0.154)
No parents in 1968	0.316	0.274
	(0.245)	(0.248)
Father foreign born	-0.0812	0.00690
	(0.365)	(0.367)
Years in SMSA Age 4-7	-0.0173	-0.0734
	(0.231)	(0.0672)
Years in SMSA Age 8-11	-0.194	-0.0458
	(0.291)	(0.0932)
Years in SMSA Age 12-15	0.00513	0.0621
	(0.236)	(0.0719)
Parents poor	0.0234	0.0195
	(0.102)	(0.102)
Economic Variables		
In poverty Ages 4-7	-0.0336	-0.0483
	(0.129)	(0.0500)
In poverty Ages 8-11	-0.116	-0.0242
	(0.140)	(0.0599)
In poverty Ages 12-15	-0.0730	0.0567
	(0.141)	(0.0589)
Poverty*AFDC Ages 4-7	-0.253	-0.0396
	(0.163)	(0.0738)
Poverty*AFDC Ages 8-11	0.228	0.151 *
	(0.178)	(0.0859)
Poverty*AFDC Ages 12-15	-0.302 *	-0.199 **
	(0.167)	(0.0759)
Years mother worked Ages 4-7	0.124	-0.0183
	(0.120)	(0.0403)

Table 2, continued

Table 2, Continued

	(1)	(2)
Years mother worked Ages 8-11	0.0513 (0.130)	0.0667 (0.0457)
Years mother worked Ages 12-15	0.218 * (0.121)	0.0549 (0.0381)
Family Stress Variables		
Moved location Ages 4-7	-0.350 ** (0.0965)	-0.181 ** (0.0580)
Moved location Ages 8-11	-0.0543 (0.101)	-0.0329 (0.0567)
Moved location Ages 12-15	-0.273 ** (0.103)	-0.175 ** (0.0547)
Parents separated Ages 4-7	0.289 (0.185)	0.188 (0.188)
Parents separated Ages 8-11	0.196 (0.182)	0.0494 (0.176)
Parents separated Ages 12-15	-0.211 (0.173)	-0.192 (0.171)
Parent's remarriage Ages 4-7	0.205 (0.229)	0.337 (0.221)
Parent's remarriage Ages 8-11	-0.342 * (0.200)	-0.223 (0.203)
Parent's remarriage Ages 12-15	0.00138 (0.226)	0.124 (0.228)
Other change in head Ages 4-7	0.0219 (0.252)	0.0133 (0.220)
Other change in head Ages 8-11	0.309 (0.369)	0.342 (0.351)
Other change in head Ages 12-15	-0.298 (0.269)	-0.322 (0.240)
Child Care Time		
Preschool time Ages 4-5	1.75 E-4 ** (0.843 E-4)	2.03 E-4 ** (0.885 E-4)

*Significat at .10 level.
**Significant at .05 level.

probability of high school graduation whenever it occurs, although the sign is consistently negative. For those who live in poverty, the receipt of AFDC seems to have a mixed effect; the results suggest a statistically significant negative impact in the highest age category. For the middle age group, this economic status variable appears to have a positive effect, which is statistically significant in the duration specification (column 2). Finally, having a mother who works--and thereby contributes to income--generally has a positive association with high school completion; the size of the coefficient generally increases over the age of the child.

The variables indicating family stress have consistently negative impacts on the probability that the child will graduate from high school, consistent with the results in Table 1. The timing pattern of these impacts is revealing, however. Disrupting the child's physical location when he/she is young (7 years old or younger) or older (ages 12-15) has a distinctly negative, and statistically significant, effect on performance. Especially the latter effect is consistent with the common impression that disrupting the child's peer group, school, and physical location while he/she is in high school is detrimental to his/her school performance. This older-age effect is also observed for the parental separation variable, which becomes more negative as the child's age increases. The only other change in family arrangement that appears to have an impact on high school graduation is the remarriage of the mother when the child is 8-11, suggesting difficulties in adjusting to remarriage.

The preschool child care time variable shows the same positive influence we found in Table 1 and is again statistically significant.

In addition to running these models for the entire sample, we also tested to see if the same underlying structural model applied to the random sample and the SEO subsample of the PSID, and to whites and nonwhites in the sample, and to the four subsamples in terms of race and SEO and random samples. In each of these specifications, the null hypothesis that the model was the same for the relevant pairs of groups could not be rejected, even at the 10 percent level of significance. However, since other researchers have studied only whites (e.g., Behrman, Pollak and Taubman, 1986) or separate racial groups (e.g., Hill, Augustyniak, and Ponza, 1987), we present results by racial subgroups for model 2 of Table 2 in Appendix B.[8]

We convert the coefficients of estimates in Tables 1 and 2 and Appendix B into differential probabilities in Table 3. Column 1 uses the aggregate results from column 2 of Table 1; column 2 uses the time-specific results from column 2 of Table 2. The other variables in the equation are set equal to their mean. The strongest findings in both columns are those for parents' education. They show that a child whose parents both went to college has a 21-25 percent greater chance of completing high school than one whose parents did not complete high school. Having parents who completed high school is associated with a 16-17 percent increase a probability of completion compared to parents not having graduated. Clearly, then, parents' education is a very important determinant of child's education. The findings on years in poverty are small. They suggest that each year a child spends living in poverty is associated with approximately a .1 percent decrease in probability of graduation. If AFDC benefits are received by the poor, the effect of poverty status on the probability of graduation is either

Table 3

Differential Probability of Graduation

	Table 1, Column 2	Table 2, Column 2
Siblings (0-base)		
3	-3.8%	-4.0%
6	-8.8	-9.2
Parents' Education (< 12 Years as base)		
High School Grads	17.3	16.1
Some College	22.8	21.3
College Grads	24.8	23.6
Poverty (0 Years as base)		
3 years	-0.4	-0.2
6 years	-0.9	-0.5
9 years	-1.3	-0.7
12 years	-1.9	-1.1
AFDC if in Poverty		
3 years	-0.5	-1.1
6 years	-1.4	-2.9
9 years	-2.7	-5.0
12 years	-3.7	-7.1
Moves (0 as base)		
1	-1.9	--
2	-3.9	--
4	-9.4	--
1 Move, Age 4-7	--	-2.6
1 Move, Age 8-11	--	-0.4
1 Move, Age 12-15	--	-2.5
Separations (0 as base)		
1	-0.7	--
2	-1.7	--
3	-2.5	--
1 Separation, Age 4-7	--	3.0
1 Separation, Age 8-11	--	0.9
1 Separation, Age 12-15	--	-3.8

not affected or is increased; AFDC benefits for poor families generally reduce the probability of graduation but by only .2-.4 percent per year received. The other calculations suggest that a parental separation is associated with a decrease in probability of graduation of between 1 and 3 percent, while each geographic move is associated with a decrease of between 2 and 3 percent.

The influence of siblings is considerable in both of these specifications. Being an only child compared to having three siblings increases the probability of high school graduation by about 4 percent. The evidence on number of moves suggests an 9 percent reduction in the probability of graduation if there are four moves during the school years. Moves have the largest negative impact between ages 4 and 7 and ages 12 and 15, when a move reduces the probability of graduating by 2-3 percentage points. The separation results are also large and suggest the importance of separation for children ages 12-15.

VI. SUMMARY AND NEXT STEPS FOR RESEARCH

This study addresses the intergenerational pattern of well-being and achievement in the U.S. population. We have focused on an outcome which has been shown to be strongly related to persistent poverty and welfare dependency--the completion of high school. First, we established the relationship of this outcome for a sample of nearly 1300 young adults to a large set of underlying individual and parental characteristics. These base estimates indicated that a child's educational attainment is positively and significantly associated with growing up in a family having a religious affiliation, growing up with

only a few siblings, and especially with the educational level of both the mother and father.

As a second step, we introduced a variety of economic, family stress, and child care time variables into the estimates. Experiencing family dislocations--especially, physical location moves--adversely affects the probability of graduating from high school. Parents' education, particularly that of the father, loses some of its statistical importance in this more complete model.

Finally, the effect of the timing of the economic, family stress, and child care events and circumstances was estimated. The time spent by the parents in child care while the child is young has a strong and significant effect on the probability of high school graduation in all of the estimates. While many of the family stress variables were generally negative for all of the age categories, the occurrence of a change in physical location is strongly and negatively related to school completion when this event occurs close to or during high school ages and at the youngest ages (4-7). This sort of dislocation, often associated with change in school and disintegration of friendships, appears to be more disruptive than parental separations.

These results support a number of findings suggested in previous literature, but do so with a large and unique data set of children whose life course has been traced over an eighteen-year period. They also suggest a number of effects such as economic circumstances, child care time, the receipt of welfare benefits if poor, and the change in physical location that have not been addressed in previous studies. The longitudinal nature of the data has allowed a large number of economic, family stress, and child care events and circumstances to be analyzed

while holding constant a number of important background and parental circumstances.

The research reported here, however, raises a number of issues that have yet to be resolved. They concern the definition of the dependent variable as a dichotomous variable rather than a continuous variable and the ever-present problems of potential endogeneity of the independent variables and the possibility that unobserved variables (such as parental or child IQ, motivation, or constitution) may be causal to both the educational attainment outcome and to the events and circumstances that are identified in the study. Research now in process involving the estimation of hazard functions on an educational attainment variable measured continuously and the use of sibling information to attempt to control for unobserved family heterogeneity should provide additional robustness to the estimates reported here. However, data constraints such as the lack of information on IQ, neighborhood, and school quality will always leave estimates such as these open to some skepticism.

NOTES

[1]If all of those 0-6 in 1968 were still in the sample, there would be 3099. Thus 1249 of those originally included in 1968 were no longer in the PSID sample in 1986.

[2]Because of attrition from the time use data, we corrected for sample selection bias in making these estimates. Of the original 619 respondents, 133 failed to participate in all four waves of the survey. A Heckman two-step estimator was calculated and used in the regression to correct for the (possibly) nonrandom attrition from the sample.

[3]The parents' education and religion variables were measured in 1968, the first year for which this information was available on PSID files. At this date, the children's ages ranged from 0 to 4 years. The questions were asked of the current family head and wife. In most cases information was obtained from the child's parents, but in some cases the information would describe a stepparent or other family member. If the child was in a single-parent home in 1968 (usually female-headed), there would be no information for the second parent. A dummy variable, one parent = 1, was created and assigned to these observations. If the child lived with grandparents or other nonparents in 1968, and no information is available on either parent, a dummy variable, no parents = 1, was created and assigned.

[4]For our sample, the simple relationship between being nonwhite and graduating from high school is negative. On average 81 percent of nonwhites in the sample graduated whereas 89 percent of the whites graduated. These are weighted percentages.

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[5]Weighted tabulations of the underlying data suggest that the biggest difference is between only children--who are also first born--and children with siblings. There is, however, a generally negative association between number of siblings and high school graduation.

[6]These differential probabilities are estimated from the converted coefficients in Table 1. See Table 3, below.

[7]The weighted percentage of the sample who completed high school was .90 (.96, .97) for children of fathers who are high school graduates (had some college, graduated from college); and .91 (.97, 1.00) for children of mothers who are high school graduates (had some college, graduated from college), respectively.

[8]In terms of background variables, father's and mother's education appears to play a larger role among white children than among nonwhite children in determining the likelihood of high school completion. All parental education variables have a positive sign for both racial groups, but none of them are significant in the nonwhite subgroup. In terms of family size (number of siblings), there is evidence that having more siblings has a stronger negative association with the probability of graduating among nonwhite children than among white children. Turning to economic variables, there appear to be few differences in sign, but some differences in whether a variable is statistically significant. Receiving AFDC if poor appears positive for nonwhites in the middle age range, but negative for both whites and nonwhites over the 12-15 age range. Finally in terms of family stress variables there are also few differences. An exception is the statistical significance of moves in the adolescent years among nonwhites and of remarriage in

the 8-11 years for nonwhites compared to whites. The negative role of other change in head is only statistically significant for whites in the adolescent age group.

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Appendix A

Coefficients and Standard Errors from Time-Use Data Regressions

	Men	Women
Constant	256.4	1051.9**
	(276.1)	(492.1)
No. of children	3.5	39.9
	(13.3)	(33.1)
Age	-0.0919	-7.34
	(4.40)	(6.74)
Spouse's age	-3.26	-7.92
	(4.45)	(7.47)
Education:		
8-11	-4.84	296.7*
	(65.8)	(174.7)
HS grad	-11.9	23.8
	(61.4)	(145.8)
Some college	-51.4	80.3
	(84.9)	(175.2)
College grad	-36.0	19.8
	(87.6)	(190.9)
Spouse's Education:		
8-11	65.9	-110.0
	(74.1)	(152.0)
HS grad	27.0	-134.4
	(49.3)	(114.2)
Some college	34.5	39.0
	(68.9)	(152.4)
College grad	4.11	-50.8
	(90.5)	(145.3)
Hours (market) work	-0.514	-18.1**
	(3.11)	(8.32)
Hours work squared	-0.0263	0.249
	(0.0405)	(0.161)
Spouse's hours work	-0.842	-3.70
	(1.02)	(3.02)
Owned house? (0-1)	-66.7	-75.5
	(76.8)	(103.2)
Family income	0.00263	-0.0112*
	(0.00164)	(0.00628)
Spouse present? (0-1)	216.7	647.8*
	(193.5)	(341.6)
Adjusted R-squared	.102	.200

*Significant at .10 level.
**Significant at .05 level.

Appendix B

Table 2, Model 2, by White/Nonwhite
Coefficients and Standard Errors

	White	Nonwhite	Nonwhite*SEO
Constant	-0.0785	0.851 *	0.509
	(0.516)	(0.504)	(0.524)
Background Variables			
Female	0.170	0.210 *	0.172
	(0.155)	(0.124)	(0.130)
Catholic	0.749 **	-0.260	-0.00313
	(0.282)	(0.349)	(0.379)
Jewish	3.06	--	--
	(57.69)		
Protestant	0.208	-0.0345	0.0975
	(0.231)	(0.273)	(0.286)
Number of siblings	-0.0745	-0.0885 **	-0.0805 *
	(0.0669)	(0.0437)	(0.0464)
First born	0.177	0.102	0.136
	(0.196)	(0.191)	(0.209)
Father HS grad	0.314 *	0.338	0.384
	(0.188)	(0.224)	(0.256)
Father some college	0.706 **	0.414	0.330
	(0.296)	(0.523)	(0.554)
Father college grad	0.371	0.345	-0.141
	(0.331)	(0.598)	(0.702)
Mother HS grad	0.457 **	0.261	0.240
	(0.179)	(0.164)	(0.172)
Mother some college	0.780 **	0.562	0.503
	(0.344)	(0.369)	(0.389)
Mother college grad	4.01	3.24	2.84
	(39.48)	(33.70)	(29.82)
One parent in 1968	0.125	0.0449	0.0644
	(0.352)	(0.189)	(0.199)
No parents in 1968	4.44	0.157	0.140
	(209.00)	(0.275)	(0.290)

Appendix B, continued

Appendix B, Continued

	White	Nonwhite	Nonwhite*SEO
Father foreign born	0.298	-0.0738	-0.0411
	(0.610)	(0.537)	(0.673)
Years in SMSA Age 4-7	-0.147 *	-0.0166	0.0169
	(0.087)	(0.138)	(0.143)
Years in SMSA Age 8-11	0.0163	-0.0483	-0.0469
	(0.116)	(0.193)	(0.204)
Years in SMSA Age 12-15	0.0624	0.00664	0.00430
	(0.0864)	(0.172)	(0.181)
Parents poor	0.0597	0.0230	0.0517
	(0.165)	(0.140)	(0.148)
Economic Variables			
In poverty Ages 4-7	-0.113	-0.0467	-0.0440
	(0.100)	(0.0607)	(0.0644)
In poverty Ages 8-11	-0.0416	-0.00584	0.0346
	(0.121)	(0.0719)	(0.0762)
In poverty Ages 12-15	0.368 **	-0.0174	-0.0565
	(0.150)	(0.0688)	(0.0722)
Poverty*AFDC Ages 4-7	-0.147	-0.0406	-0.0172
	(0.190)	(0.0843)	(0.0877)
Poverty*AFDC Ages 8-11	-0.0873	0.180 *	0.129
	(0.225)	(0.102)	(0.106)
Poverty*AFDC Ages 12-15	-0.431 **	-0.175 **	-0.169 *
	(0.214)	(0.0860)	(0.0891)
Years mother worked Ages 4-7	-0.0302	-0.0161	0.0119
	(0.0633)	(0.0569)	(0.0602)
Years mother worked Ages 8-11	0.0772	0.0626	0.0489
	(0.0693)	(0.0663)	(0.0700)
Years mother worked Ages 12-15	0.0937	0.0297	0.0334
	(0.0593)	(0.0538)	(0.0562)
Family Stress Variables			
Moved location Ages 4-7	-0.182 *	-0.170 **	-0.169 **
	(0.0942)	(0.0807)	(0.0854)

Appendix B, continued

Appendix B, Continued

	White	Nonwhite	Nonwhite*SEO
Moved location	0.0931	-0.107	-0.116
Ages 8-11	(0.0924)	(0.0794)	(0.0829)
Moved location	-0.148	-0.200 **	-0.189 **
Ages 12-15	(0.0924)	(0.0732)	(0.0768)
Parents separated	-0.159	0.226	0.169
Ages 4-7	(0.347)	(0.233)	(0.241)
Parents separated	-0.238	0.234	0.131
Ages 8-11	(0.274)	(0.261)	(0.269)
Parents separated	-0.296	-0.168	-0.188
Ages 12-15	(0.247)	(0.269)	(0.286)
Parent's remarriage	0.231	0.475	0.412
Ages 4-7	(0.373)	(0.307)	(0.311)
Parent's remarriage	0.308	-0.543 **	-0.543 *
Ages 8-11	(0.346)	(0.275)	(0.284)
Parent's remarriage	0.117	0.243	0.261
Ages 12-15	(0.326)	(0.374)	(0.381)
Other change in head	-0.599	0.102	-0.091
Ages 4-7	(0.656)	(0.244)	(0.266)
Other change in head	4.91	0.366	0.693 *
Ages 8-11	(296.20)	(0.366)	(0.420)
Other change in head	-0.717 *	-0.172	-0.224
Ages 12-15	(0.389)	(0.327)	(0.336)
Child Care Time			
Preschool time	1.96 E-4	1.66 E-4	1.88 E-4
Ages 4-5	(1.51 E-4)	(1.16 E-4)	(1.21 E-4)